Novel Abstractions in Programmable Networks

M.Sc. Project's proposals at the Network Intelligence Group at RISE SICS, Kista.

Project 1 – High Performance NFV Abstractions in Programmable Networks
This project aims to overcome the performance problems of state of the art network functions virtualization (NFV) systems by realizing high performance NFV service chains using either native or container-based solutions (in contrast to the virtual machine-based approach used by e.g., OpenStack). Apart from performance, this project focuses on: automated deployment of network functions (NFs), run-time monitoring of NFs, and dynamic (re)configuration of NFs when load imbalances occur. The evaluation will be conducted using an industrial-grade SDN controller (e.g., ONOS) and high performance NFV frameworks, such as, the Data Plane Development Kit (DPDK) and Click . The evaluation must focus on data plane performance, control plane scalability, and efficient resource management.

Supervisors
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Project 2 – NFV Performance Guarantees in Programmable Networks using Data Mining
This project aims to render network controllers smarter than to date by collecting a broad range of monitoring data from deployed network functions virtualization (NFV) service chains. This information will be used to make placement and scheduling decisions, thus allowing service chains to meet certain service-level objectives (SLOs), e.g., bounded latency and minimum throughput. The evaluation will be conducted using an industrial-grade network controller (e.g., ONOS) and high performance NFV frameworks, such as, the Data Plane Development Kit (DPDK) and Click. The evaluation must include a study of different scheduling schemes on the performance of the service chains and the evaluation of an algorithm that dynamically maps scheduling schemes to service chains to satisfy their SLOs.

Supervisors
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Project 3 – Design of Future Networking Satisfying IoT Requirements
This project aims to solve two challenges in future networking: quality of service (QoS) guarantees and scalability. With the advent of IoT, machine-to-machine communication becomes prevailing. Two challenges arise: how to schedule communications with QoS guarantees and how to deal with the enormous number of IoT devices. Students are encouraged to build models of networking devices and design new communication protocols, scheduling algorithms and network controlling systems to satisfy the requirements. The evaluation will include the verification of the QoS guaranteed communication, the efficiency of the scheduling algorithm, and the scalability of the network controlling system.

Supervisors
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References
[1]. OpenStack, https://www.openstack.org/
[2]. ON.LAB CORD, http://opencord.org/
[3]. ON.LAB ONOS, http://onosproject.org/
[4]. DPDK. Data Plane Development Kit, http://dpdk.org
[5]. The Click modular router, https://github.com/kohler/click

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